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Editor: S. S. English.
Managing Editor: R. E. Enlow.
Contributors to this issue:
B. R. Blankenship, W. E. Carnahan, A. J. Feeney, E. J. Fitzgerald, D. W. Goodman, W. W. Martin, R. E. Prescott, S. D. Rosen, H. H. Smith, M. T. York.

A Multipronged Attack

The President of the United States in his 1963 farm message cited research to develop ways of eliminating the boll weevil as a principal means of lowering cotton production costs.

A multipronged research attack is underway against this most costly and stubborn insect. In the last year, scientists have reported promising new biological, mechanical, and chemical approaches to combat boll weevils:

- The cotton industry is encouraged over a recent Louisiana experiment, where—for the first time—boll weevils were eradicated on a small test plot by the release of male boll weevils sterilized by the chemical apholate (AGR. RES., March 1963, p. 4). Sterilized male weevils were released to mate with females in the natural population, which in turn laid eggs that did not hatch. Result—self-destruction of the insect population.
- Large-scale spraying of cotton with methyl parathion during the fall has controlled boll weevils in southwest field tests (AGR. RES., February 1963, p. 10). The treatment catches weevils during a vulnerable period and destroys them before they can go into diapause—the sluggish, fattening period that precedes hibernation. A combination of fall and spring treatments—if done by all growers over a large area—might achieve eradication, or at least lower the population to a level that can be readily eliminated by the release of sterile males.
- ARS scientists found a microscopic organism called schizogregarine that causes a deadly infection among weevils. Now they are experimenting to see whether the microbes could be spread in cottonfields to combat the weevil.
- A machine will be field tested this year in Mississippi to check how efficiently it picks up from the ground beneath the plants the fallen cotton squares in which the larval stage of the boll weevil develops (AGR. RES., April 1963, p. 3). Picking up 90 percent of the squares every 5 days should keep weevil populations low enough to insure a good cotton crop. The machine exceeded this in laboratory tests.
- Scientists have located and extracted three substances from cotton that are being studied for possible use in control plans against boll weevils. One is an attractant, another is a feeding stimulant, and the third is a repellant. The repellant might be bred into cotton in amounts that would repel boll weevils (AGR. RES., April 1963, p. 4).

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AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture

A MACHINE TO DESTROY BOLL WEEVILS

Chopper picks up, destroys fallen cotton squares, source of weevil reinfestation

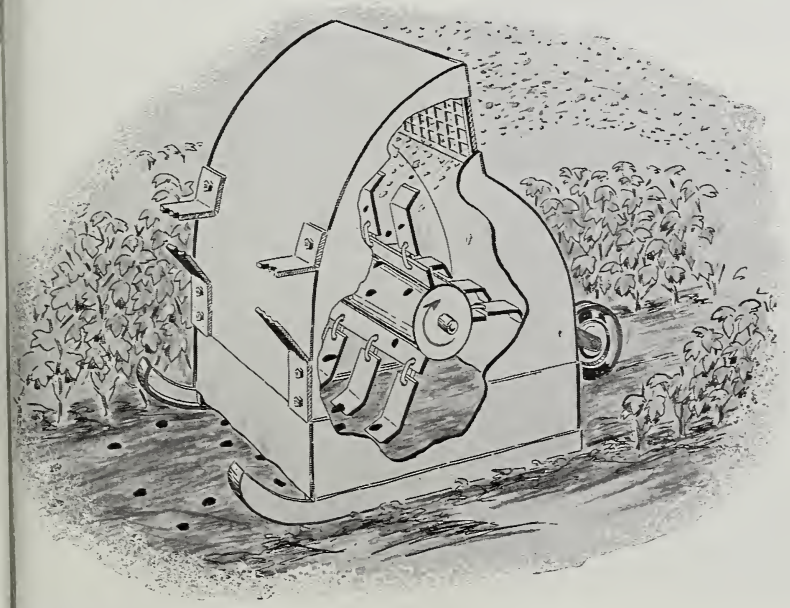
■ A new approach to control of boll weevils is ready for field testing by ARS agricultural engineers and entomologists in the South.

This new approach involves an experimental machine that breaks the insect's life cycle by picking up larvae-infested cotton squares (flower buds) that have fallen from the plants, and destroying the squares and larvae.

Mature boll weevils lay their eggs in growing cotton squares, which provide food for the hatching larvae. The infested squares drop off the plant, and the larvae develop into a new generation of mature weevils if the squares are not destroyed soon after they fall.

Cottongrowers formerly employed crews to pick up fallen squares each week, but rising labor costs forced them to abandon this procedure. Entomologists have found that picking up 90 percent of the fallen squares every 5 days keeps weevil populations low enough to insure a good cotton crop without using insecticides.

Rapidly rotating flails create a suction that pulls fallen squares into the chopper, where squares and larvae are beaten to a pulp.



The new machine, which is expected to pick up at least 95 percent of the fallen squares, will be field tested for the first time during the coming growing season in several Louisiana test plots. It was designed and built by ARS engineer E. C. Burt at the Boll Weevil Research Laboratory, State College, Miss., in cooperation with the Mississippi Agricultural Experiment Station.

The experimental machine is a modified flail chopper (see drawing). It has several flails that rotate at 1,800 r.p.m., creating a suction similar to that of a vacuum cleaner. This suction pulls fallen squares from the ground into the flails, where they are beaten to a pulp and then blown back onto the ground.

Last year, when Burt used a regular flail chopper on weevil-infested squares, no more than 1 percent of the weevils in the chopped material survived under laboratory conditions. He says the percentage should be even lower under field conditions, because some of the eggs or larvae that survive the flails would be destroyed by heat, dry weather, insect parasites, and birds.

In the forthcoming field tests, the

Turn Page

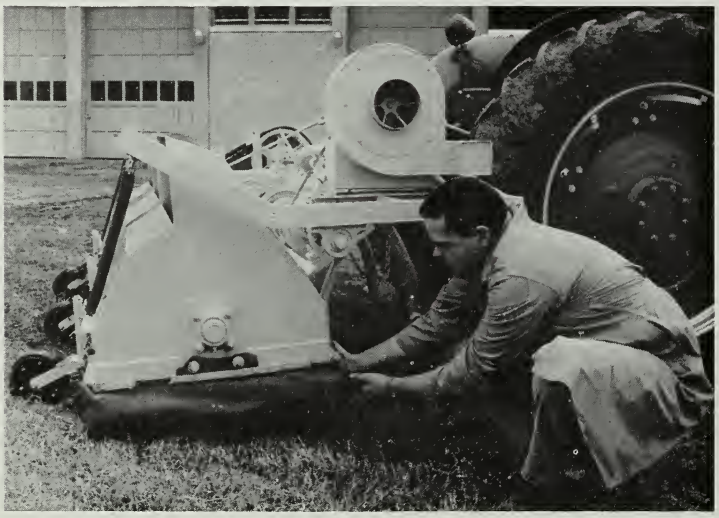
A MACHINE

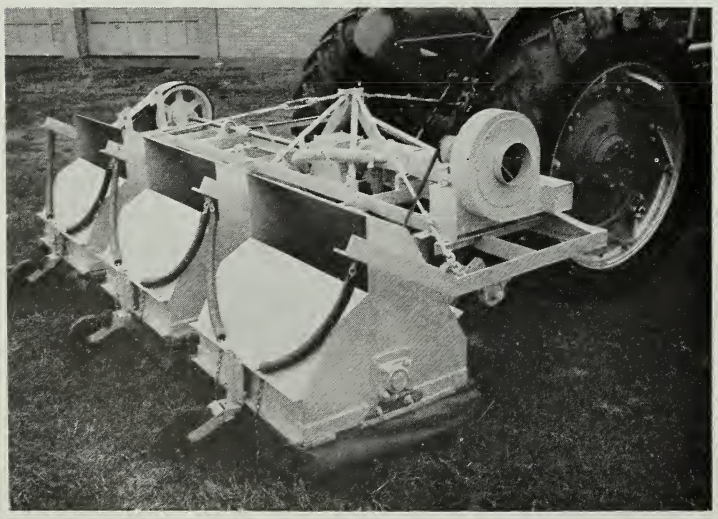
(*Continued*)

new machine will be used to pick up fallen squares about every 5 days in cottonfields that are heavily infested with boll weevils. Entomologists will make periodic insect counts to check the machine's effectiveness. Results will be compared with those on another weevil-infested plot that will be treated with insecticide.

Burt says the machine could also be used—with minor modifications—to shred stalks or harvest row-crop forage.☆

Agricultural engineer E. C. Burt adjusts the canvas baffle on one of the units of his 3-row test chopper. The machine picks up larvae-infested cotton squares, chops them, and blows the material back onto the ground. With minor modifications, the chopper could be used as a stalk shredder or a row-crop forage harvester.





Found in Cotton:

A BOLL-WEEVIL REPELLANT

■ The boll weevil's favorite food—the cotton plant—is also the source of a substance that repels this insect. ARS scientists who found the substance have developed a procedure for extracting it from plants.

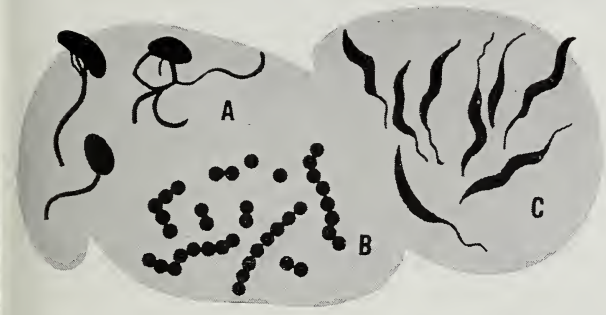
The repellant is the third substance extracted from cotton plants that has potential value in controlling the boll weevil. The other two are a feeding stimulant that makes cotton plants appetizing to boll weevils (AGR. RES., September 1962, p. 6) and an attractant that draws the insects to the plants.

These three substances were found by ARS scientists at the Boll Weevil Research Laboratory, State College, Miss., working in cooperation with the Mississippi Agricultural Experiment Station.

This research holds possibilities for several methods of controlling boll weevils. It is conceivable, for example, that plant breeders can develop cotton varieties either with such a high content of the repellant that the plants will repel weevils, or with such a low content of the attractant that the plants will not attract weevils.

The scientists are continuing research on the three substances to learn more about their physical and biological properties and to identify them chemically.☆

Selenomonas *bacteria (A) prefer amino acids but can use ammonia.* Ruminococcus *bacteria (B) require ammonia and fatty acids for growth.* Succinivibrio *bacteria (C) need only amino acids.*



DO RUMEN BACTERIA NEED AMINO ACIDS?

Many do not, research shows, which could lead to radical changes in livestock rations

■ Excellent meat and milk production from ruminants fed poor-quality roughage and—instead of protein—ammonia and certain volatile fatty acids . . .

This may never happen. But recent basic research findings by ARS bacteriologists hint of progress in this direction.

High-protein concentrated feeds now used by ruminants could then be channeled to swine and poultry, which convert them to meat more efficiently. The rapidly expanding human population has created a long-range need to find such improved ways of using existing food resources.

Ruminants use fibrous crops, urea

Domestic ruminants—cattle, sheep, and goats—are already known for their superior ability to turn fibrous crops and urea into meat and milk. The key agents in this process are bacteria and other micro-organisms in the rumen, or first stomach. These agents change much consumed feed into microbial protoplasm and fermentation products, which are absorbed or further digested in the abomasum, or true stomach.

The researchers are seeking a better understanding of the metabolism and growth requirements of individual microbial species in the rumen. The results of their study may simply help define how bacteria break down feeds and synthesize nutrients. But the new knowledge might be a major step toward eliminating the need for protein in ruminant rations.

Scientists have generally assumed that amino acids from protein are essential nutrients for many important rumen bacteria.

But recent research by M. P. Bryant and I. M. Robinson at Beltsville, Md., revealed that at least 72 of 89 strains of rumen bacteria don't need amino acids from protein to grow. Instead, many species represented by the 72 strains need ammonia and certain volatile fatty acids, and they do not use amino acids efficiently. Some of the bacteria can use either amino acids or ammonia and fatty acids for growth.

Few strains need amino acids

The Beltsville researchers say that only five strains, all of one species, required amino acids—probably just methionine—for growth.

The other 12 strains failed to grow in the laboratory medium. These apparently needed some unidentified nutrients not supplied.

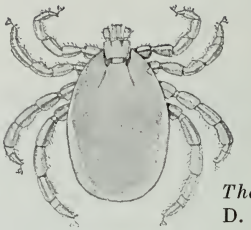
The 89 strains, representing at least 11 species, were taken from the rumen of a cow that had been fed a ration of alfalfa hay and grain. All strains were studied individually in the laboratory.

Ammonia in the form of urea is already being used to replace part of the protein in rations, especially in low-roughage rations. The study supports the possibility that urea and fatty acids could replace the rest.

Scientists face complex problems

Many complex problems stand in the way of developing protein-free rations. For instance, scientists might have to find a way to make fatty acids available in an economical form. Another problem—still more serious—is concerned with regulating the release of various fatty acids and ammonia in the rumen at a rate that would insure their efficient use by bacteria.

Urea fed as the main substitute for protein in rations may supply so much ammonia in the rumen that bacteria can't multiply fast enough to use it. The excess ammonia then enters the animal's bloodstream and can become toxic. Other researchers are studying ways to regulate the release of nutrients in the rumen and overcome this and related difficulties.☆

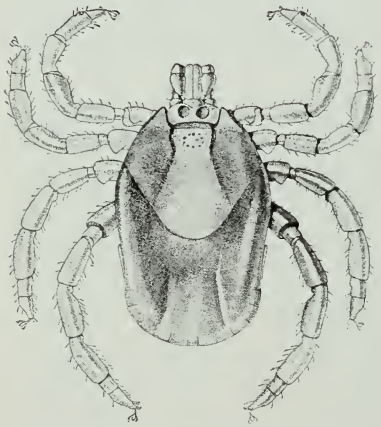


The male tick D. nitens.

A test horse developed a fever 12 days after young ticks were placed on its ear; an analysis of the horse's blood confirmed the disease.

HORSE TICK FEVER

Equine piroplasmosis invades parts of the United States—scientists prove that this horse disease can be spread by the tropical horse tick



The female of the tropical horse tick Dermacentor nitens. (*This drawing is not in proportion to the drawing of the male tick, above.*)

■ Equine piroplasmosis—a blood disease of horses, donkeys, and related animals—has invaded parts of the United States, and ARS scientists have proved that this disease can be spread by the tropical horse tick, *Dermacentor nitens.*

The tick has been identified in Texas, Florida, and Georgia, and it may be in other States. The species is abundant in the West Indies, along the eastern coast of Mexico, and in several Latin American countries.

Death rate is 5 to 50 percent

The disease, which is fatal in 5 to 50 percent of the cases, is caused by either of two protozoa species, *Babesia caballi* or *B. equi.* All cases found in Florida have been caused by *B. caballi,* but the particular species responsible for the few cases found in Georgia has not yet been determined.

Detection of equine piroplasmosis is difficult because no reliable diagnostic test is yet available and the disease is clinically very similar to equine infectious anemia. Positive diagnosis, therefore, has depended on finding the protozoa in the red blood cells of the infected animal. A diagnostic blood test for the disease is now under development by ARS scientists at Beltsville, Md.

Owners are urged to report suspects

Federal and State livestock sanitary workers urge horse owners and veterinarians to notify them immediately if equine piroplasmosis or equine infectious anemia is suspected so that blood samples can be collected for diagnosis.

Ticks found on infected animals should be collected and forwarded to the Animal Disease Eradication Division, Parasite Reference Center, Beltsville, Md. The tropical horse tick is usually found in or near the ear of the host animal. The inside of the ear is often inflamed and packed with tick offal, which gives off a nauseating odor.

The combined work of ARS veteri-

narians, parasitologists, and entomologists is responsible for identifying the tick vector. On October 11, 1962, C. W. Thornton, ARS veterinarian in Florida, collected four engorged female adult ticks from an infected horse near Fort Lauderdale. These ticks were forwarded to Beltsville, where they were identified by veterinarian R. K. Strickland and entomologist R. R. Gerrish. The identification was confirmed by parasitologist Allen McIntosh.

Ticks are tested as carriers

Veterinarian T. O. Roby and entomologist D. W. Anthony then tested the ticks for their ability to transmit piroplasmosis. The ticks were kept in a jar having a constant humidity until they deposited their eggs, the eggs hatched, and the larvae (seed ticks) appeared ready to feed.

Approximately 1,000 seed ticks were placed on the ear of a horse that had been born and raised at Beltsville and had not been used for studies of this kind. A linen bag was placed over its ear and attached with cement to prevent the ticks from moving over the animal. The horse was placed in an isolation building designed for tick-transmission work.

Fever developed in 12 days

About 200 seed ticks attached themselves to the skin of the horse's ear. These ticks fed continuously through their larval, nymphal, and adult stages. Twelve days after the ticks were placed on the ear, the test horse developed a fever. Examination of the horse's blood revealed the protozoa *B. caballi.*

The first known case of equine piroplasmosis in the United States was diagnosed in August 1961, in Florida. Neither the date nor method of entry into the country is known.☆

Safflower . . . Yields well on salty soil

■ ARS research indicates that safflower, an oilseed crop, can be grown successfully in salty soils usable for only the most salt-tolerant crops.

This research provides information needed by farmers who are considering growing the crop for the rapidly expanding market for highly unsaturated safflower oil. The use of this oil in food products—principally margarine and cooking and salad oils—increased from 2 million pounds in 1960 to 45 million pounds in 1961. Safflower oil is also used as a drier in paints and varnishes.

Studies by ARS agronomist L. E. Francois and plant physiologist Leon Bernstein show that safflower tolerates salinity nearly as well as cotton, which can be grown under high salt conditions. This tolerance should make safflower a potential crop for southwest locations such as the Buckeye area of the Lower Salt River Valley, Ariz., where each acre-foot of ground water used for irrigating cotton may contain as much as 5 tons of salt.

Laboratory studies in soil cultures showed that safflower tolerates only half as much salinity during germination as at later stages of development. Farmers can help prevent germination injury by planting on double-row or sloping beds to minimize salt accumulation around the seed.

The experiments were conducted at the U.S. Salinity Laboratory, Riverside, Calif. The scientists irrigated field plots at 7- to 11-day intervals with water containing three levels of salinity. Salt treatments started 3 weeks after planting and continued until plants matured 14 weeks later.

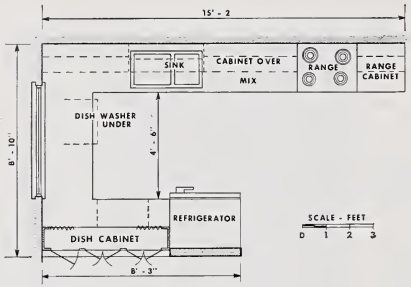
Soil salinity was determined by saturating soil with water, then extracting the water and measuring its electrical conductivity, in millimhos per cubic centimeter. The scientists tested production at salinity levels of 4.7 millimhos (low), 7.9 millimhos (medium), and 11.2 millimhos (high). Results were compared with production under nonsaline conditions.

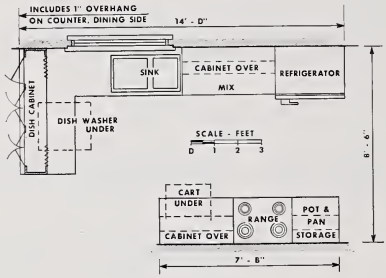
At the high salt level, safflower seed production was 75 to 80 percent of the yield on nonsaline plots. Only tolerant crops produce as much as 50 percent of their normal yield at this degree of salinity. No significant difference was found in tolerance of four varieties tested—Pacific 4, N–10, U.S. 10, and Gila.

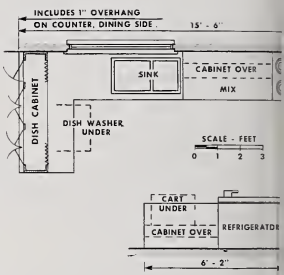
Salinity restricted seed production on the lateral branches of the plants, the scientists observed, although it did not affect the main branches. Plants on the salt plots also produced fewer flowering heads and fewer seeds per head than plants on the nonsaline control plots. Reduction in seed yield per head generally was more pronounced than the decrease in number of seed heads.

Salt speeded up maturing of the plants, however. The high-salt plot flowered 3 days earlier than the control plot and was ready for harvest 3 weeks earlier. Plant height and stem diameter decreased progressively with increasing salinity. Plants grown at the high salt level were 20 percent smaller.☆

The new kitchen features three different floor plans, each designed to help the homemaker conserve energy in preparing and serving family meals. The overall view (right) shows how storage cabinets, work areas, and equipment have been arranged to save steps and energy. Slant-front cabinets are hung only 4 inches above the counter surface instead of the usual 15 or 18 inches.







CHOOSE YOUR KITCHEN C

■ A new energy-saving kitchen—the third in a series designed by ARS—combines attractiveness and versatility with features particularly helpful to older or handicapped women.

Kitchen Design No. 3 and preceding designs 1 and 2 (AGR. RES., October 1956, p. 8; November 1959, p. 8) are based on studies of human energy used and the space needed for storage and various kitchen activities. Each design was carefully planned to reduce walking, stooping, lifting, and reaching.

Has slant-front cabinets

In developing design No. 3, which offers a choice of three floor plans, housing specialists M. S. Howard and G. K. Tayloe (pictured on cover) and architect W. R. Parker gave special attention to wall-storage facilities. Distinctive features are slant-front, wall-hung cabinets with shelves of varying depths—designed to keep stored items within easy reach. The top shelf in the mix cabinet, for example, is 65 inches high—an easy reach from a sitting position. And it is the right depth—9 inches—to keep wide utensils at the homemaker's fingertips.

Accordion-type cabinet doors

Accordion-type doors on the wall and dish cabinets can be pushed aside to expose the entire storage area while work is in progress. When closed, the doors—held shut with magnet latches—add an attractive vertical design to the kitchen.

A sink having a shallow bowl, in addition to a deeper bowl, is desirable in an energy-saving kitchen, the scientists say. The shallow bowl leaves leg room under the sink, and the homemaker can sit comfortably while peeling vegetables or handling dishes.

A convenient cutting board

The shallow bowl in the new kitchen is fitted with a removable hardwood cutting board. When not in use, the board is stored under the sink in a narrow vertical compartment. A homemaker seated at the sink can pull out the board and place it over the sink without getting up.

Other convenience features of the kitchen are a trash container compartment, two pullout workboards, a pullout towel rod, an adjustable posture chair, and a two-shelf serving cart. Storage places are provided for the chair and the cart.☆

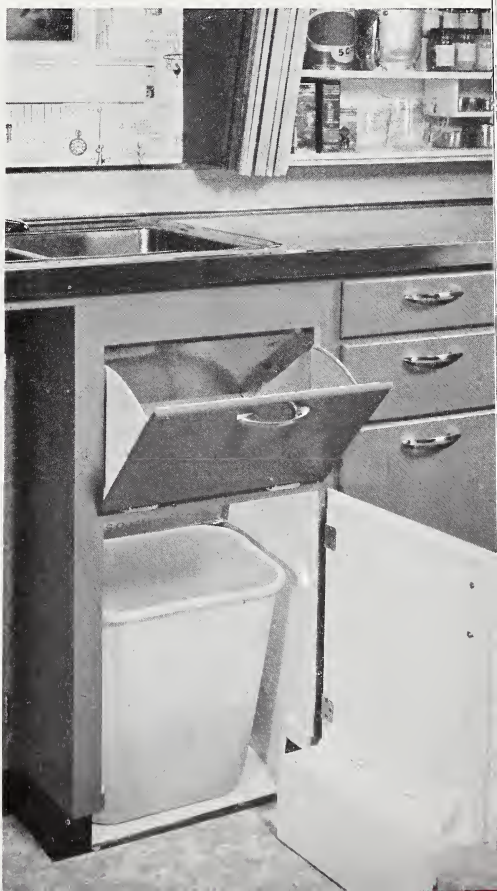
NVENIENCE

Kitchen design offers alternate floor plans, each having energy- and space-saving features

ABOVE—A handy hardwood cutting board fits the shallow bowl of the sink above the garbage disposal unit. When not in use, the board is stored under the sink.

LEFT—Pass-through dish storage, which partially separates the kitchen from the dining area, can be reached from either side and is located near the dishwasher for maximum efficiency. The bottom shelf, for heavy dishes, was built close to the counter to conserve energy. The top shelf is the right height for removing and storing dishes with one hand. A section at the right, shown closed, is for foods such as crackers, spreads, and ready-to-eat cereals.

RIGHT—Built-in trash unit has a metal chute that directs trash into container. The specially designed door with attached toe space makes it easy to remove the trash container.



DWARF EVERGREENS

Rare collection of 1,500 tiny trees is given to National Arboretum

TOP—Francis deVos, assistant director of the Arboretum, kneels beside a dwarf Alberta spruce, 15 to 20 years old. This species usually grows 80 feet tall.

BOTTOM—The normal counterpart of this dwarfed western juniper grows to a height of 40 to 45 feet.

■ Millions of Americans may eventually share one of the world's rare collections of dwarf evergreens now being assembled at the National Arboretum in Washington, D.C.

This collection, which contains 1,500 tiny trees—freaks of nature that occur rarely and unpredictably, was given to the Arboretum by W. T. Gotelli, a well-known amateur horticulturist of South Orange, N.J.

Other arboretums will benefit

The evergreens are being planted on 4 acres of north slope at the Arboretum. ARS horticulturists plan to propagate and distribute cuttings from the trees to other arboretums and to cooperating nurseries. So these attractive little trees, now a rarity, may someday become a familiar sight in American arboretums and in many lawns and gardens.

Along with the collection of miniature evergreens, Gotelli donated other items, both artistic and functional, used in his private garden setting. These include bronze statuary, stonework, normal-sized trees for background contrast, and equipment for a complete irrigation system. All will be used to beautify the Arboretum planting, which was designed by John Jennings, Summit, N.J., landscape architect, who helped Gotelli locate and obtain many of the specimens.

The collection is notably comprehensive—it includes all major conifer genera. There are numerous junipers, spruces, and yews, as well as many dwarf forms of hemlock, pine, fir, and cedar. One of the dwarf cedars is the rare Japanese *Cryptomeria.* The false cypress is also well represented in the collection. This species is believed to have more dwarf forms than any other conifer.

A specimen of prostrate blue spruce and a rare weeping form of Serbian spruce are among the outstanding items, H. T. Skinner, director of the Arboretum, says.

Many only a few inches tall

Dwarf conifers may reach 6 feet in height, but many are still only a few inches tall when they are 25 years of age or older. A 15-year-old Jarvis dwarf hemlock in the collection is small enough to fit a garden pot.

Gotelli traveled throughout the world to acquire specimens when

news of a true dwarf evergreen reached him. Most of the rare trees were gathered in Europe, but a good representation of trees from Japan, Australia, New Zealand, and Canada is included in the collection.☆

TOP—E. P. Eshbaugh, in charge of planting the Gotelli collection at the Arboretum, points out a weeping form of Colorado blue spruce that has an area of abnormal bud development called a witch's broom.

CENTER—This dwarf weeping evergreen, a white pine, is about 15 years old.

W. T. Gotelli, who gave the collection to the Arboretum, examines a rare form of weeping evergreen.

Apricots dried by the DBD process (right) are actually more like fresh fruit, when cooked, than apricots that were cooked after being dried in the sun (left). The DBD fruit has better color and flavor.

DBD—an improved way to dry fruit

■ A new process for drying fruit has been developed in California that produces a product with the bright color and fine flavor of sun-dried fruits. At the same time it eliminates exposure to rain.

Conventional drying of fruits by heated air in mechanical dryers has never produced the bright colors and excellent flavors produced by sun drying. Fruit dried by the new technique—called "dry-blanch-dry" (DBD)—not only has the bright colors and fine flavors but, when cooked, is actually more like fresh fruit than sun-dried fruit. Peeled peaches and pears, unknown on today's markets, can be dried to an attractive quality by the DBD process.

Although now more expensive than sun drying, the DBD process is much faster, and rising labor costs may reverse the economic advantage.

In the DBD process, fruit is first dried at 180° F. for a few hours or to 50 percent of its original weight. It is then blanched (exposed to steam) for a few minutes and finally dried at 155° F. for 6 to 24 hours.

Sun drying, on the other hand, requires a few days to a few weeks to reduce the moisture content to the required 15 to 20 percent. Every fourth or fifth year, rain falls during this drying period and causes damage to the fruit. Outdoor drying of large acreages of fruit, placed in single layers on trays, also creates problems of sanitation and cleaning.

The new DBD process was developed by ARS engineers M. E. Lazar, E. J. Barta, and G. S. Smith at the Western utilization research laboratory, Albany, Calif.

Use of the DBD process for drying apples eliminates the need for sulfuring, now required in mechanical drying of this fruit. The ARS engineers use a citric acid and salt dip to control surface darkening before blanching. Blanching then inactivates the enzymes responsible for discoloration inside the fruit.

Golden raisins (dried Thompson seedless grapes) can also be produced without sulfuring. The light, golden color is preserved by blanching the grapes before the dry-blanch-dry process is started.☆

Parasitologists study antibodies in calves, sheep to learn more about . . .

Immunizing Livestock Against Parasites

Secretions from a nodular worm's body openings clumped and adhered to the worm (blotchy areas) in a culture medium containing an extract of tissue from a calf's worm-infested intestine. This indicates an antigen-antibody reaction.

■ The immunization of livestock against parasitic worms is one of the hottest subjects in animal parasitology research.

The idea is not new. Principles of immunology and their application to parasitic diseases were extensively studied in the 1930's. But the prospect of controlling parasites with chemicals appeared far brighter, and development of immunological methods lagged.

Scientists now studying parasite immunology have much better research tools than were available 30 years ago. One of these, a technique for growing parasitic worms in test tubes, enables researchers to observe changes and reactions of the worms during the part of their lives normally spent inside the host.

Two studies now underway show some of the progress made—and some of the problems encountered—by scientists who are seeking immunological methods for controlling parasites.

In a study at Beltsville, Md., ARS parasitologists are using laboratory-cultivated worms to study the substances parasitic worms eliminate. The scientists wanted to know whether these substances have antigens that stimulate the animal to produce antibodies in defense against the worms.

After infecting a calf with nodular worms, the scientists prepared an extract of tissue from the animal's intestine, where the worms are most active. When this extract was added to a test tube medium in which nodular worms were being grown, the secretions from the worms' body openings clumped and adhered to the worms. Normally, these materials disperse in the medium. This clumping indicated an antibody-antigen reaction, says parasitologist F. W. Douvres, who is leading the study.

Douvres believes that antibodies against the worms were present in the calf-tissue extract and that these reacted with antigens from waste products or secretions of the test tube worms. No clumping occurred when blood serum and tissue from a worm-free calf were added to the medium containing nodular worms.

No clumping when serum added

Clumping did not occur, either, when only serum from the infected calf was added to the medium. Thus antibody production might be limited mainly to the most heavily infested part of the calf's body.

The scientists have demonstrated for the first time that antigens produced by worms in a test tube react with antibodies produced by experimentally infected animals. Douvres now plans to determine whether injecting an animal with the antigens will build up resistance against subsequent parasite infection.

In the other immunological study, underway at University Park, N. Mex., scientists are testing the possibility that infecting sheep with a weak strain of the large stomach worm will protect them against subsequent infections of more virulent strains. ARS parasitologists R. W. Allen, K. S. Samson, and C. P. Hibler are conducting the study in cooperation with the New Mexico Agricultural Experiment Station.

A group of worm-free sheep was infected with larvae of a weak strain found in the pronghorn antelope. Later, this group and a control group of worm-free sheep were given larvae of a virulent strain that usually infects sheep. The group of sheep that had first been infected with the antelope-strain worm ate more feed, gained more weight, and had fewer sheep-strain worms than the others.

Although the weak strain made the sheep resistant to the virulent strain under controlled conditions, it has not protected sheep on pasture, where they become naturally infected with worms. Sheep infected with worms of the antelope strain were no more resistant to infection when put on pasture than untreated sheep.

Much more research must be done before immunological methods can be used effectively to control internal parasites. For instance, a worm-infected animal may produce antibodies not only against worms but also against parasites infecting the worms. When this happens, the antibody response may do more harm than good.☆

World authority heads pioneering research laboratory devoted to . . .

Plant Hormones and Regulators

■ A pioneering research laboratory has been established by ARS to step up basic research on the ways hormones and growth-regulating chemicals affect plants.

This is the 20th pioneering research laboratory set up by USDA to help meet the need for basic research in specific areas. Scientists in these laboratories try to develop new theories and uncover new principles that will advance agricultural sciences. The pioneering investigations were begun in 1957 as part of USDA's regular program of basic research, which includes studies that will provide new basic knowledge needed to solve recognized agricultural problems.

ARS plant physiologist J. W. Mitchell, a world authority on plant-growth-regulating chemicals, has been named leader of the Pioneering Research Laboratory for Plant Hormones and Regulators. The new unit is located at the Agricultural Research Center, Beltsville, Md.

Mitchell's staff includes plant physiologist P. C. Marth, who is known internationally for his research showing how the growth and behavior of plants can be controlled through the use of regulating chemicals. Marth, who has been with USDA since 1935, has frequently collaborated with Mitchell in plant physiology research and in the publication of their findings.

Other staff members of the new pioneering laboratory are P. J. Linder, plant physiologist; J. F. Worley, plant pathologist; and Mrs. Marjorie Montgillion, laboratory technician.

Regulators used in many ways

Plant-growth-regulating compounds are used in many practical ways—for example, to kill weeds and thin fruit-tree blossoms, to speed or retard growth of ornamentals, and to stimulate root cuttings. But scientists do not fully understand how the regulating action takes place. They must gain this understanding before they can hope to develop consistently effective control over plant development through the use of chemical regulators, hormones, and disease-controlling compounds.

One of the first objectives of the new laboratory team is to learn how a plant absorbs an applied chemical or hormone and translocates it to a particular site in the plant where it triggers a response. The scientists will also try to determine what kind of chemical reaction takes place in the plant, how enzyme activity may be altered, and how growth is accelerated or retarded. The studies will involve analyzing the effects of hormones and regulators on individual cells and on the plant as a whole.

Mitchell has been studying the effects of growth regulators on plants since 1934, when he was a research fellow at the University of Chicago. He came to USDA in 1938.

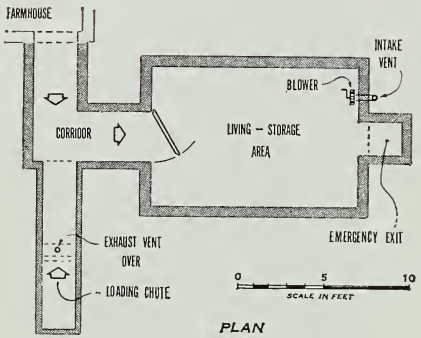
His early research contributed to the development of the weed killer 2,4-D, which started the revolution in weed-control practices 20 years ago. Today, the use of organic chemicals to control weeds by interfering with their metabolism is accepted in the United States and many other parts of the world.

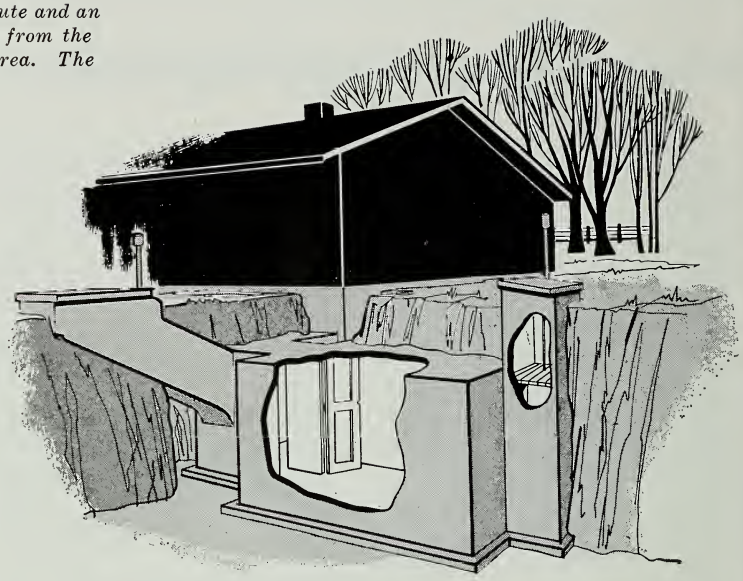
Mitchell's research has also led to techniques that improve ornamental plants. For example, shorter, more compact poinsettias with attractive dark-green foliage appeared on the market for the first time last Christmas (AGR. RES., December 1962, p. 13). The technique was developed by ARS scientists, who used chemical retardants and cyclic lighting to control the plant's development.

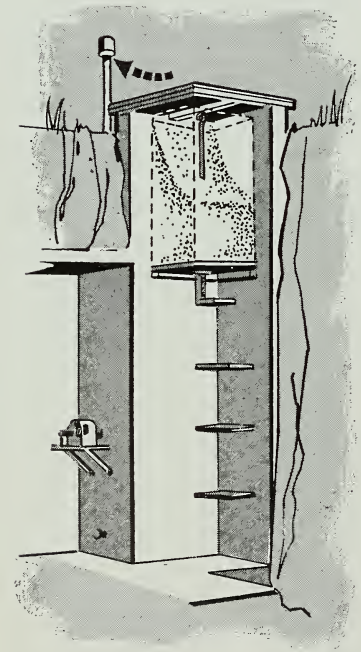
Mitchell has also applied his knowledge of chemical growth regulators to basic studies of antibiotics for the control of plant diseases.☆

J. W. Mitchell (right), leader of USDA's newest pioneering research laboratory, discusses procedures with his staff (left to right): P. J. Linder, Mrs. Marjorie Montgillion, P. C. Marth, and J. F. Worley.

Main shelter area is flanked by a loading chute and an emergency exit. The access corridor leads from the farmhouse basement to the living, storage area. The entire shelter has a 3-foot earth cover.







For emergency escape, the occupant pries loose a board in the bottom of the escape hatch to release sand.

Fallout Shelter For Farms

Structure doubles as a storage cellar for fruit and vegetables

■ The fruit and vegetable cellar of a generation ago has taken on a new look. Now it's a fallout shelter, too.

ARS architects at Beltsville, Md., have designed a dual-purpose structure that can be used for fruit and vegetable storage and for fallout protection in the event of a nuclear emergency.

The new plan (No. 5934), a revision of a previous storage-cellar plan, shows how to build a reinforced concrete structure that will accommodate six people. Space for larger families can be provided by lengthening the shelter 2 feet per person.

The structure is cast in place below ground, sealed with polyethylene film, and covered with about 3 feet of earth. According to the Office of Civil Defense, this type of shelter provides excellent protection from fallout radiation. Persons in the shelter would be exposed to 1/5,000th as much radiation as outside the shelter.

The plan shows how to install proper ventilation, electrical outlets, and an emergency exit that can also be used for additional storage space. Some suggestions are given for storage, but detailed arrangements are left to the user.

Two people can stock the shelter quickly and easily by using the loading chute that opens above ground. Emergency provisions should meet OCD recommendations.

Working drawings for Plan No. 5934 are available from extension agricultural engineers at most State agricultural colleges. There is usually a small charge.☆

AGRISEARCH NOTES

Chemosterilant combats fruitfly

The Mexican fruitfly is the latest in a growing list of pests that may yield to the sterility technique of insect control.

A heavy population of these fruitflies was greatly reduced in a 10-acre mango grove in Mexico, following the release of laboratory-sterilized male flies. The grove is located near Yautepec, Morelos.

More than 3¼ million Mexican fruitflies were sexually sterilized with the chemosterilant tepa. The pupae were dipped in a 5-percent solution of tepa. Sterilization resulted as the adults emerged and came in contact with the dry residue of the chemosterilant.

The field test was conducted in 1962 by ARS entomologists J. G. Shaw and M. S. Riviello in cooperation with the Mexican Department of Agriculture. The scientists selected a semi-isolated grove of 212 mature trees between two extensive mango plantings, which were used as controls for the experiment.

The test grove was divided into four treatment sections, one of which was irrigated naturally by small rivulets flowing from an impounded spring. Both off-season crop production and fruitfly infestation were heavier in the irrigated section. The control groves were not irrigated.

The sterile flies were released, 26,000 to 250,000 at a time, at intervals of 3 to 10 days from February 19 to May 6, 1962.

In March, infestation of the off-season fruit was as high as 80 percent in the irrigated section of the test grove and 3.5 percent in the unirrigated sections. At the same time, infestation of fruit in the two control groves averaged about 23 percent.

By May 8, however, infestation of the regular season crop was down to 14 percent in the irrigated section and 0.3 percent in the unirrigated section of the test grove, while infestation in the two control groves had risen to 46 percent.

From these and later counts, Shaw and Riviello concluded that the release of sterilized flies, though small in number and begun late in the season, was quite effective in protecting the main crop of mangos from Mexican fruitfly infestation.

Sugarbeet-pollen viability test

A technique for determining the viability of sugarbeet pollen has shown promise in ARS-Colorado experiments. This technique, which uses a chemical that dyes live tissue a distinctive color, was adapted from staining methods used in studying viability of seeds.

A stain that detects living mature pollen would be valuable to sugarbeet breeders, who store pollen for later use with male-sterile breeding lines in developing superior hybrids.

ARS plant geneticist R. J. Hecker, who developed the new technique in cooperation with the Colorado Agricultural Experiment Station, is studying tetrazolium salts—the most widely used staining chemicals for testing seed viability.

The most promising of eight salts tested on sugarbeet pollen was 3-(4,5-dimethylthiazolyl-2)-2,5-diphenyl tetrazolium bromide. This chemical stained pollen grains an easily distinguishable purple to deep purple. Nonviable mature pollen was not stained; neither was abortive pollen from cytoplasmic male-sterile plants.

Although tetrazolium salt looks promising as an indicator of sugarbeet-pollen viability, Hecker says more research is needed to determine its practical value in breeding work.

Environmental chamber for poultry

Scientists at the Southeast Poultry Research Laboratory, Athens, Ga., will soon be able to create virtually any environment needed to study poultry diseases.

The scientists will control temperature, humidity, air movement, and other environmental conditions in airtight chambers. One chamber has already been designed and built by ARS agricultural engineer A. T. Hendrix, in cooperation with the University of Georgia. This chamber will serve as a guide for constructing additional units.

Other environmental conditions that can be controlled in the new units include ionization of the air; concentrations of ammonia, carbon dioxide, and other gases; light intensity; and temperature of the chamber's roof and outer walls.

The units will make possible studies on the interrelationships of management, diseases, and heredity of poultry. Several variations of treatment can be tested simultaneously. Broilers, for example, can be hatched and reared at the same temperature and humidity, then subjected to various light intensities, diseases, or other treatments.

The chambers can also be used in evaluating different kinds of litter and flooring for poultry houses.

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AGRISEARCH NOTES

Portable scale weighs beehives

One man can weigh a bee colony in less than a minute with an ARS-designed portable scale that looks like a combination forklift and two-wheeled warehouse truck mounted on bicycle wheels.

Most methods used to weigh honeybee colonies today require at least two men and considerable time.

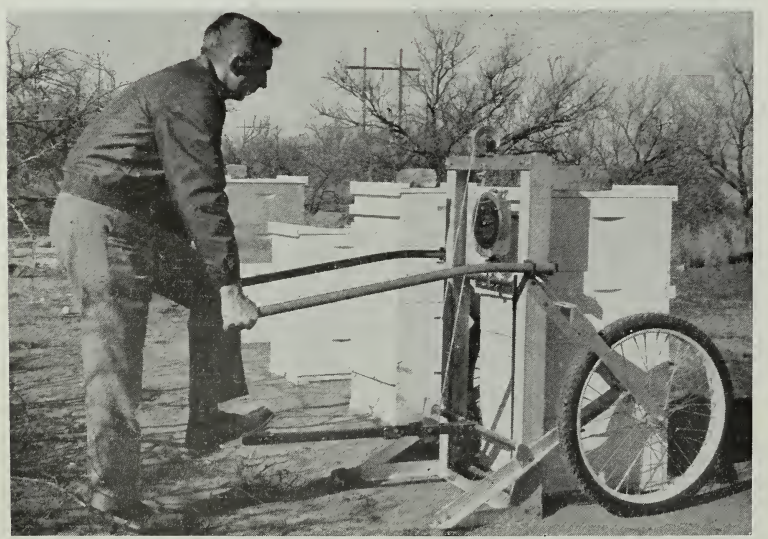
Researchers must weigh bee colonies periodically to measure changes in honey production. The new scale is being used at the Arizona Agricultural Experiment Station, Tucson, to compare honey production in shaded and unshaded hives.

Here's how the scale works: It is wheeled to a colony and positioned with the forklift under the hive. The operator steps on a lever that lifts and weighs the hive containing the bee colony and honey.

The scale, which has a weighing capacity of 600 pounds, is inexpensive and easy to build and operate. It can be made of either steel or aluminum. Balloon-type bicycle tires make it possible to move the scale quickly and easily over uneven ground.

The scale was designed by ARS agricultural engineer C. D. Owens in cooperation with the Arizona station. Owens built the scale primarily for research work, but he says it could be built and used by commercial beekeepers.

Working drawings are available from Owens at the Arizona experiment station.



C. D. Owens weighs a bee colony with the portable scale he developed.

Ensiling forage reduces residues

Two preliminary laboratory studies indicate that making hay crops into silage may reduce or eliminate pesticide residues. If further research confirms these studies, the number of pesticides for use on forage crops may be increased. Some highly effective pest-control chemicals cannot now be used because they leave residues that are not permitted in livestock feed.

In a study at Ithaca, N.Y., in cooperation with the Agricultural Experiment Station of Cornell University, ARS agronomist D. L. Linscott and technician R. D. Hagin found that significant amounts of the herbicide 4-(2,4-DB) disappeared from alfalfa and birdsfoot trefoil ensiled in test tubes. The herbicide was added while the chopped forage was being packed into the tubes.

After 30 days of fermentation, 63 percent of the herbicide had disappeared from the alfalfa silage, and 13 to 37 percent had disappeared from the birdsfoot trefoil silage.

At Beltsville, Md., animal husbandman J. C. Derbyshire and agronomist R. T. Murphy tested the insecticide Diazinon in ryegrass silage. Only 3 percent of the chemical remained in the silage after 22 days of fermentation in glass jars.

The scientists are now trying to determine whether fermentation or some other process breaks down the pesticides. Further research is needed to check these results under farm conditions.

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